

TRADITIONAL ELECTRICITY SYSTEMS IN SPAIN: FENSA (1927-1991)*

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ABSTRACT

Because the literature of European economic history has paid little attention to traditional electricity systems, the interest in studying *Fensa* lies in analysing the different types of companies, which helped to shape the development of the Spanish electricity sector prior to its present oligopolistic structure. This case provides insight into two issues. First, we learn about the behaviour of the second-generation companies (those that based their production on a controlled hydropower regime), which, despite their limited size, made their commercial specialisation (supplying the dynamic industrial market of Guipúzcoa) their main comparative advantage. Second, we analyse the behaviour of those companies which at this time, as distribution companies and/or subsidiaries of the large Spanish companies (*Iberduero*), were an instrument of the policy of integrating regional markets.

Keywords: micro-business history, regional and urban history, electric utilities, production, pricing, market structure

JEL Classification: N84, N94, L94, L11

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RESUMEN

En un contexto historiográfico europeo que ha prestado poca atención a los sistemas eléctricos tradicionales (SET), el interés de estudiar *Fensa* reside en analizar los diferentes tipos de empresas que fueron configurando el desarrollo del sector eléctrico español antes de su actual estructura oligopolística. Este caso permite conocer, por un lado, el comportamiento de aquellas compañías de segunda generación –las que basaron su explotación en un régimen hidráulico regulado– que, a pesar de su limitado tamaño, hicieron de su especialización comercial (el abastecimiento del dinámico mercado industrial de Guipúzcoa) su principal ventaja comparativa. Y, por otro, analizar la actuación de aquellas firmas que se convirtieron, ya como distribuidoras y/o filiales de las grandes empresas españolas (Iberduero), en un instrumento de la política de integración de sus mercados regionales.

Palabras clave: historia empresarial, historia regional y urbana, empresas eléctricas, producción, precios y estructura de mercado

1. INTRODUCTION

Little is known about the different business types present in the European electrical sector prior to the Second World War, despite the existence of excellent works. The history of the electricity industry has been centred on the foundation, growth and development of the most important companies. The main explanation is derived from the characteristics of the electricity industry itself. Since its beginnings, this sector has generally been considered as the business, which obtains the largest social and economic benefits, irrespective of the type of property or its territorial extension, when it is operated under a form of monopolistic industrial organisation based on vertical integration. In the last quarter of the 20th century, however, nobody disputed, after the theoretical and empirical evidence gathered mainly in the 1970s in the United States, that the natural monopoly in the electricity sector was only relevant for transmission. Consequently, generation, distribution and commercialisation could be carried out in a competitive manner, either by a vertically integrated model or an unbundled model (Joskow and Schmanensee 1983; Newbery 1999).

The existence of a transmission network, public or private, but common to a large extension of territory, favours the participation of small- and medium-sized operators, bringing into question one of the fundamental principles of the sector: the pre-eminence at all times, places and conditions of economies of scale, as well as the business strategies adopted by its largest companies (Hirsh 2001).

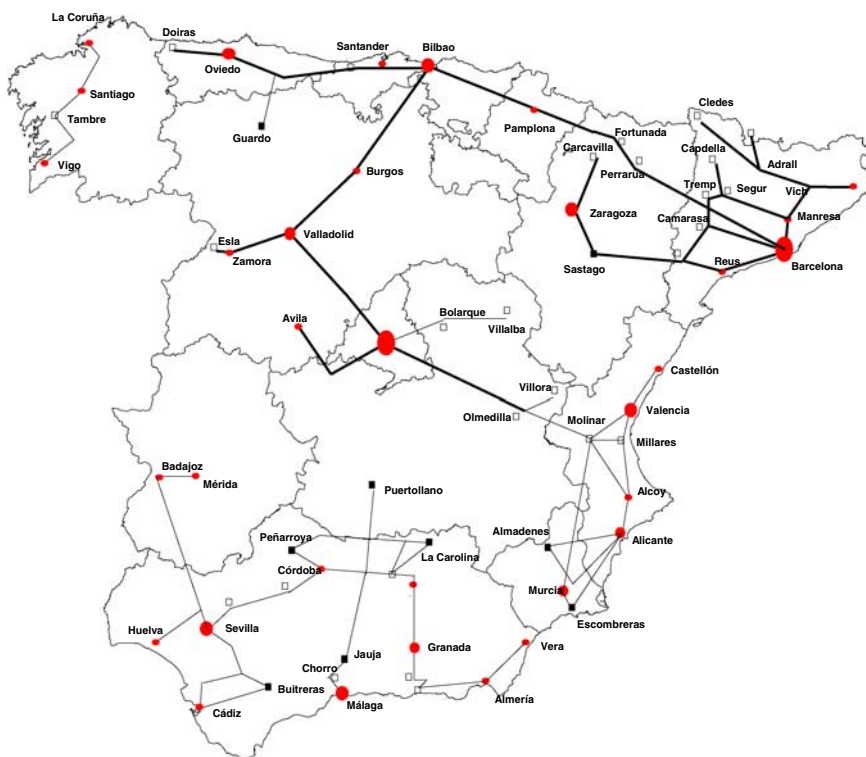
This being the case, one of the questions that become relevant from the point of view of business history concerns the nature of the role of traditional electricity systems (TES)¹ in the provision of an efficient electricity service before the appearance and consolidation of modern integrated electricity systems.

Although there are many important studies of large Spanish utilities before the Civil War, this picture becomes less clear when we start to consider the behaviour of the small- and medium-sized companies that made up the TES. Many authors have noted the importance small- and medium-sized companies had in the early stages of development of the Spanish electricity industry. There have been different strategies of analysis. Many studies in the field of business history have aimed at contextualising the beginnings of large companies, firms that in the medium and long term were more successful and were therefore the preferred object of study². From the historical angle, many studies highlight the evolution of technological, economic and organisational characteristics prior to the construction of the regional and

¹ By TES we understand a wide variety of types of companies that included small power stations that took advantage of some local feature right up to electricity companies with more complex connected networks for business but of a limited size and degree of integration between companies. From the chronological viewpoint, the TES, generally characterized by a predominance of medium-sized and small companies, were of unquestionable importance in the first 30 years of the development of the sector. This definition is not intended to be closed, but active and dynamic in order to better understand what preceded integrated electrical systems (IES). Therefore, it is a construct capable of improvement and adaptation to other economic and historical contexts.

² Among others, Antolín (1989, 1996, 2006) and Garrués (1994) about *Hidroeléctrica Ibérica*; Cayón (1998, 2002), Aubanell (2000, 2005) and Tedde and Aubanell (2006) about *Hidroeléctrica Española*; Díaz Morlán (1998, 2006) about *Salto del Duero*; Maluquer (1983) and Capel and Urteaga (1994) about *Barcelona Traction*; Bernal (1993, 1994) about *Sevillana*, *Mengemor* and *Chorro*; and Germán (1990) about *ERZ*. The only work about the history of the Spanish electricity sector as a whole before the Civil War in recent decades is the study by Bartolomé (2007).

MAP 1
SPANISH HIGH-VOLTAGE TRANSMISSION GRID (1940)
 (100 kV)



Source: Sirvent *et al.* (1960). Key: (—) Lines with voltage above 100 kV.

national electricity systems³. These analyses, especially in the last three decades, have brought our knowledge up to the level of other European countries. There are, of course, some fields in which the historiography has grown less in relation to TES. For this reason, from the business history point of view, this article proposes the application of the case study to the medium-sized and small utilities. Assessing their production, commercial and financial strategies helps us, when we have a sufficient critical mass of works, to build a clearer picture of our diverse and complex industrial past and its impact on the present.

The desirability of exploring the TES does not imply that the starting point of this article includes an aprioristic idea about the advantage of this

³ See, for example, Amigo (1989, 1992), Germán (1990), Maluquer (1992), Aubanell (1992), Núñez (1994, 1995, 1997), Garrués (1996, 1997, 2006a and 2006b), Carmona (1999), and Hidalgo (2012).

TABLE 1
THE SPANISH TES IN COMPARISON WITH THE FIRST RIS IN 1949

	Electricity Systems	Production			Direct distribution*		Companies		RIS leadership**	
		ES	TES	TES/ES	TES	RIS	TES	RIS	Companies	Electricity distributed in RIS
		%					Number			%
		A	B	C = B:A	D	E	F	G	H	I
1.	Iberduero	25	33	29	87	65	193	26	Iberduero	69
2.	Hidroila	22	35	34	83	52	87	7	Hidroila	70
3.	Galicia	4	6	29	96	81	42	7	Gallega de Electricidad	75
4.	Asturias–Cantabria	12	3	6	96	78	39	12	Viesgo; Hidrocantábrico	62
5.	Andalusia	11	12	24	89	93	45	12	Sevillana; Mengemor; Chorro.	94
6.	Catalonia	21	3	3	90	72	17	16	Barcelona Traction; Fluido Eléctrico	70
7.	Aragón	5	9	41	91	72	46	6	ERZ	67
	Spain	100	100	22	87	70	469	86	33	95

TES: traditional electricity systems; RIS: regional integrated systems; ES: electricity system.

Note: *The rest of the distribution was carried out by other companies; **Companies with more than 20 GWh of the electricity distributed.

Source: Own compilation from Sindicato de Aguas, Gas y Electricidad (1949).

model of business compared with large firms and/or the first IES. Furthermore, as this study shows, it is not easy to identify clear lines of division between the strategies associated with either system. Although the differences of scale, co-ordination and information of the IES firms always gave them a capacity to act which was beyond the scope of those linked to the TES, the level of adaptive efficiency of each company should be studied in its historical and economic context⁴.

For this reason, the interest in analysing *Fuerzas Eléctricas de Navarra (Fensa)*⁵ lies in enriching the panorama outlined so far of the different types of companies that participated in the development of the Spanish electricity industry prior to its current oligopolistic structure and, in particular, the transition from what are referred to as TES to integrated systems. In this sense, referring to Navarra, if the studies of *Arteta* and *Irati* were representative of those pioneering companies that, thanks to their economies of diversification, were able to survive the growing maturity of the markets (Garrués 2006a and 2006b), this study of *Fensa* will allow us to examine two other interesting issues. First, to learn about the behaviour of the second-generation companies, those that based their business on a controlled hydropower regime, and which had as their main competitive advantage their commercial specialisation (supplying the dynamic industrial market of Guipúzcoa). Second, to analyse the performance of those companies that became, whether as distributors or subsidiaries of the great companies in the country (*Iberduero*, from 1946), an instrument of the policy of integration of regional markets (e.g. Navarra).

All of these matters are developed in different sections. Section 2 deals with the birth of *Fensa*, as well as its productive and commercial strategy, with particular attention to its pricing policy. Section 3 looks at *Fensa*'s behaviour in the Guipúzcoa market and its relations with two of the largest companies in the country (*Salto del Duero* and *Hidroeléctrica Ibérica*). In Section 4 the company's economic-financial development is evaluated. Section 5 describes its instrumental function, as a subsidiary of *Iberduero*, after 1946. Finally, the last part will summarise the main points of the paper.

2. THE BIRTH OF A SECOND-GENERATION COMPANY: PRODUCTION AND COMMERCIAL STRATEGY

The second phase of industrial electrification, from the technological viewpoint, came about due to the innovations derived from electricity transmission over medium and long distances. These allowed the businesses

⁴ From the point of view of dynamic and evolutionary efficiency, understood as adaptive, see North (1990).

⁵ The primary sources are collected at the end of the paper under the title of Sources and a more detailed account is given in Garrués (1996, pp. 667-758 and pp. 1011-1060).

to benefit from economies of location, scale and scope, which facilitated the use of the most appropriate local hydro resources, as well as the exploitation of the large descents existing in mountain ranges and also the small gradients of large rivers.

Although the advantages of high-voltage power supplies have been known since 1883, the transmission of large amounts of power over long distances took several decades to become widespread (Hausman *et al.* 2008). Its economic viability only came about once it was technically possible to build large dams to control the flow. With these dams it became feasible for the first time to take full advantage of economies of scale in generation, as long as the increase in minimum flow and its control allowed the extension of constant annual energy contracts and reduced the overruns caused by the low load of some plants. The reduction of generation costs associated with the increase in size of production units, benefited from the widening of the market due to the improvement of production resources, the quality of service and also, in some cases, the costs. Additionally, this decrease in costs increased the range of profitability of electricity transmission and opened up new possibilities for the inter-connection of systems.

In 1926, the engineer Víctor Urrutia indicated that the most common type of dam was a diversion dam and channel length, without large reservoirs (run-of-the-river power plants; Urrutia 1926). This delay between learning about the transmission of electricity at high voltage and the technology becoming widespread, given a sufficiently large potential demand, can be explained in the case of Spain by the concurrence of a number of different factors⁶. The waterfalls were a long distance from the points of consumption, which substantially increased the costs involved in dam projects. Private business, which in some cases were able to convince Spanish and/or international sources of finance of the advantages of participating in the larger scale business (Díaz Morlán 1998, 2006; Valdaliso 2006), did not receive much economic support from the Spanish Administration (Maluquer 2006, pp. 61-76; Bartolomé 2011). However, the main restriction was technologically economic. Large dams underwent a spectacular development once the new possibilities of the use of reinforced concrete became more widely known, due to its greater safety, versatility and economy, now supported by a theoretical basis that complemented the traditional empirical method. This coincided with the growing process of mechanisation in construction, in part due to the increased labour costs that occurred during the First World War and also the important development of the internal combustible engine.

In this technological and economic context, *Fensa* was established in February 1927, with a share capital of 3 million pesetas, with the object of

⁶ Bartolomé (2005) clearly explained many of these reasons when analysing the failed attempt to establish a national network and, as a result, the delay in the integration of the Spanish regional electricity markets.

producing and distributing electricity from the exploitation of the River Salado reservoir. This meant the technical, financial and managerial re-launch of *Hidroeléctrica de Alloz*, a failed business venture, which in 1916 had tried to develop a project designed by the engineer Emilio Azarola.

From a technical point of view, *Fensa* decided to expand the capacity of the reservoir of *Alloz* (to 83.5 hm³) to exploit the high-load peaks during times of low water level, because there was no waterfall in the province of Guipúzcoa that could provide these supplies. The torrential character of the River Salado and the natural narrowing at the Peñas de Tarrabia made this an ideal site for constructing a hydroelectric dam. The decisions to build a dome dam (one of the thinnest in Europe for its height) and develop the hydropower resources were taken by a team of highly qualified engineers⁷. The construction of the reservoir of *Alloz* was the result of a consortium between *Confederación Hidrográfica del Ebro* and *Fensa*, from which both benefited. While the former company solved its serious problem of low water levels in the upper River Ebro (28,000 ha), the latter succeeded in becoming the best controller of electricity in the poorly base load-supplied industrial market of Guipúzcoa⁸.

As for the financial aspect, *Fensa*, in contrast to what had happened to its predecessor, was able to count on the support of a more varied and solid managerial and shareholding group. Its share capital was subscribed by members of the local upper and middle classes, which, coming from different socio-professional and political backgrounds, were very active in the setting up of the most important electricity company in the province. All the same, in its early days *Fensa* behaved like a family company. The founding partners were at the same time its most important promoters, main shareholders and most prominent managers. With the passing of the years, the economic needs of the company made it necessary for new capital to be incorporated, including finance capital, and also for there to be changes in its board of directors, meaning that the management of the company was ever more distant from the ownership. Even so, control over the company was retained by the circle of the founders' family members, who were also very active in the setting up of other local industries⁹.

The inauguration of the reservoir of *Alloz* and its hydropower station (6,800 kW) took place on July 24, 1930. The rapid expansion of *Fensa's* electricity sales in the Guipúzcoa market was due to the production availability of its summer water flow regime and due to the low cost of its constant supply once the lack of power during winter was complemented by electricity

⁷ Among them we can highlight the advisor for the dam, Grunner and Orbegozo, one of the engineers who played an important role in Spanish hydropower development.

⁸ Errandonea (1931). In accordance with Spanish water policy (Bartolomé 2011), the state's economic contribution to dam construction was not substantial, and in fact was lower than that set by law. The company received only 15.4 per cent of the total budget (estimated to have been over 7 million pesetas).

⁹ To see the list of board of directors, shareholders and their participation in other industrial activities, see Garrués (1996).

bought from other companies in the south of the province (*Eléctrica Carcar* and *Eléctrica Recajo*). The new demand for a constant supply made it necessary for *Fensa* to buy larger amounts of electricity from other companies each year (*Compañía Hidráulica de Sumbilla* in 1932 and *Electra Puente Marín* and *Electra Aranaz* in 1940), and even to buy two waterfalls in the north of Navarra (in 1937). Thus, whilst the energy purchased between 1932 and 1936 was 20 per cent of the distributed production during the Civil War, the figure increased to 36 per cent, reaching its highest value during the 1943 drought at 70 per cent (Appendix 1). *Fensa* was transformed from a mere producer, boosted by strong demand from its new customers, into an integrated producer–distributor purchasing surplus power from other medium-sized companies through long-term agreements¹⁰. In order to rationalise its activity, *Fensa* created two subsidiary companies (*Salto de Ituren*, 1937 and *Eléctrica Aritzacun*, 1940) through which it organised high-voltage distribution in the valley of Oria and low-voltage distribution in San Sebastián.

Fensa's predilection for the Guipúzcoa market was also conditioned by the fact that the attempt carried out in 1933 to supply the capital of Navarra, through the company *Electra Pamplona*, had to be stopped because of other companies that operated in the Pamplona cartel (*Arteta* and *Irati*)¹¹.

The increasing demand for electricity led the company's directors to study the construction of a new hydropower station. Although the company had at its disposal a large number of the administrative concessions along the River Salado, the construction of the new waterfall (*Mañeru*) brought with it many problems. In 1936, *Fensa*, while drawing up a contract for the exchange of electricity with its main competitor in the Guipúzcoa market (*Ibérica*), set out amongst its conditions that there was «no obstacle of any type to the construction of this when the *Fuerzas Eléctricas de Navarra* deem it to be convenient»¹². The reason behind this condition lay in the restriction on *Ibérica*, stemming from its agreement with *Salto del Duero* (1934)¹³, in the event of it trying to increase its production facilities. Although this fact initially had a major effect on *Ibérica's* means of production, the spirit of the

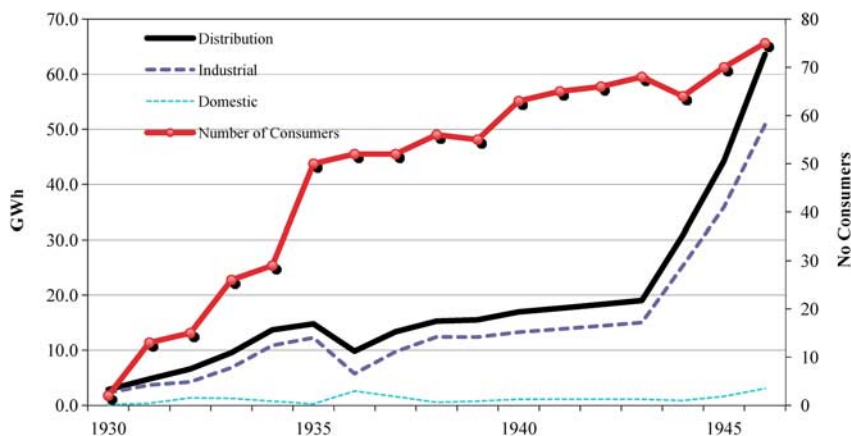
¹⁰ This is not peculiar to medium-sized enterprises. *Ibérica*, to a lesser extent, suffered a similar process after signing the agreement with *Salto*.

¹¹ The defensive behaviour of *Irati* and *Arteta* against *Electra Pamplona*, buying energy from *Fensa*, is understandable considering that the new productive superiority of *Pamplona* could break the relatively stable cartel formed by the first three companies after 1916. The price that *Irati* y *Arteta* paid, given the production and financially weakened position of *Pamplona* in those years, was used by *Ibérica*, through a supply agreement signed in 1933 with *Electra Pamplona*, to enter the Pamplona market (Garrués 2006a and 2006b).

¹² Records of *Fensa's* Board of Directors (from now on RFBD), 29/05/1936, p. 61 and RFBD, 26/03/1936, p. 60.

¹³ On the agreement between *Salto del Duero* and the *Hydro Group*, signed 2 years later, in February 1936, see Díaz Morlán (2006, pp. 294–311). This author provides a clear explanation of the *Duero* business context and its effects on the development of the Spanish electricity sector. Reading these pages is extremely helpful to fully understand Section 3 of this article.

FIGURE 1
EVOLUTION OF ELECTRICITY DISTRIBUTED AND CONSUMED IN *FENSA'S* MARKET (1930-1946)



Source: Appendix 1.

agreement would be broken if the company improved its resources through agreements with other companies. All of this, obviously, meant that it depended on the approval of *Salto del Duero*.

Another hindrance to the quick construction of the waterfall was the Civil War. Once the war was over the problems in importing equipment from the countries now involved in the Second World War, and the problems of post-war supply shortages affecting Spanish industry became a real headache for the company's board of directors. In fact, the *Mañeru* hydropower station came on line at the end of August 1944, 3.5 years later than planned. What is more, the low quality of the materials used initially reduced its theoretical capacity of 4,800 kW.

Fensa's strong commercial specialisation, based on satisfying the energy demands of industrial businesses, explains the minimal contribution of domestic consumption, and, in turn, the strong correlation that existed between industrial consumption and total consumption (Figure 1). The greater relative importance of domestic consumption in the early years was due to the fact that the company had not managed to set up the technical infrastructure necessary to be able to sell all of its production in the Guipúzcoa market. In addition, in the first year of the Civil War, according to its board of directors, «the industrial area of Guipúzcoa was under the tyranny of the Reds», and its supplies were switched off¹⁴. This meant that during this

¹⁴ Records of *Fensa's* General Shareholders' Meeting (from now on RFGM), 31/03/1937, pp. 31-32.

time a large part of the electricity was directed, through small distributors, to the domestic market in Navarra. Even so, the growth in industrial consumption in the first period (1930-1935) was spectacular. Whilst in 1930 the figure was 2.4 GWh, by 1935 this had gone up to 12.5 GWh, with only fifty clients. The company's sudden takeoff came about because of the high demand for electricity among its clients in Guipúzcoa. In fact, the rapid sale of its energy led it to buy electricity from third parties in 1932. The first clients before the Civil War were large- and medium-sized energy consumers, cement factories, paper firms and electricity companies.

The diversion of part of the production to the Navarra market and the supply of electricity to the war industry in Guipúzcoa, and to a lesser extent Vizcaya, once these provinces had come under nationalist rebel control, explains why the decrease in consumption during the period of the war was not greater. Between 1937 and 1943 consumption went up to 4.8 GWh, mainly due to greater demand from its subsidiary *Electra Aritzacun*.

The low level of growth of consumption in relation to demand during this second phase was also connected to *Fensa's* limited production capacity. However, its efforts to expand its supply through new interconnections and the setting up of subsidiaries did not prevent the first setback, the drought of 1942, from forcing the company to buy energy mainly from *Electra Puente Marín*, *Salto de Ituren* and *Electra Carcar*. The situation became even worse the following year, when its own production was limited to 68 per cent of the average annual production. Actually, the crisis merely came early in a year when the restrictions affected the whole of the Spanish electricity sector (Sudrià 1987; Díaz Morlán and San Román 2009).

In *Fensa's* final years as an independent company (1943-1946), consumption grew by 37.8 GWh, in large part due to the fact that the *Mañeru* waterfall began production in 1944, and to a lesser extent, because of the help received from its now parent undertaking, *Iberduero* (the successor to *Ibérica*). Along with the new customers, the clients who benefited most from the Navarra company's electricity were *Cementos Rezola*, *Juan Echezarreta*, *Papelera de Aralar* and *Algodonera San Antonio*.

Once the main lines of supply had been established, *Fensa* completed its portfolio with medium-sized and small clients. However, the distribution of industrial consumption in the 1930s was highly concentrated. The cement sector (31 per cent), the paper sector (27 per cent) and the electricity sector (24 per cent) were those that benefited most from *Fensa's* electricity¹⁵. In the early-1940s certain activities started to lose importance due to the establishment of new industries, *Fensa's* production limitations and greater competition from the electricity companies of Guipúzcoa. In short, from the

¹⁵ Obviously, the evolution was not linear. In 1932 the electricity consumption of the utilities was 8.6 per cent of the total consumption, 3 years later this represented 27.2 per cent and in 1944 it had increased to 32.6 per cent.

point of view of inputs, *Fensa* went from being a producer to a producer-distributor. As with *Ibérica* or *Hidroila* its function was producing and transporting electricity to large- and medium-sized customers through long-run contracts, because the distribution task was delegated to its two subsidiaries¹⁶.

The rapid growth of *Fensa* in the Guipúzcoa market was not so much due to a situation of expansion in the industry¹⁷, but rather due to the structural deficiencies of the electricity system in facing the processes of urbanisation and industrialisation (Garrués 1994, pp. 198-209). The electricity market of Guipúzcoa, the highest *per capita* electricity consumption in Spain at that time, was supplied by a traditional electrical system that was highly decentralised and poorly integrated in comparison with the highly concentrated Vizcaya model based around *Ibérica*. In fact, knowing the weakness of market penetration of *Ibérica*¹⁸, which supplied a third of the electricity consumed in Guipúzcoa through a small number of large customers and several subsidiaries, the rest of the consumption was based on the production of many small local utilities and various types of auto-producers, as well as the energy acquired in the northern province of Navarra (Garrués 1997, chapter 3). In a context where the potential demand exceeded the production capacity, the *Alloz* reservoir had important strategic value. This allowed the company to maintain a constant supply of energy throughout the year, but especially during summer and autumn¹⁹.

What was the role played by industrial prices in the commercial policy of the company?

The evolution of *Fensa*'s average prices did not vary greatly, always being between 8.6 and 9.4 cents of a peseta per kWh, except between 1941-1942. The evolution of its industrial prices (~2 or 3 cents less than its domestic prices), given the importance of industrial consumption within its total consumption, was in line with that described (Table 2).

Fensa offered widely differing rates to its clients. The company offered better rates to the major consumers than to the small- and medium-sized consumers, whose prices in the worst cases were above 20 cents/kWh (Table 3). With the passing of time there were also modifications to prices within the same type. If we exclude the customer type with the highest consumption (which had

¹⁶ In relation to *Ibérica*'s concentration of consumption and the type of clients, see Antolín (1996, pp. 241-244). Regarding *Hidroila*, see Aubanell (2000, pp. 162-163) and Tedde and Aubanell (2006, pp. 197-200).

¹⁷ In the latter sense, the industry of Guipúzcoa did not enjoy one of its better periods. In fact, the most important sectors of Guipúzcoa industry, those of paper and metal, noted a marked decrease in the rate of growth since the mid-1920s.

¹⁸ The Technical Record of the Five Year Period (1940), elaborated by *Ibérica*, is very clear. The average consumption between 1935 and 1939 shows that *Ibérica*'s participation in the Basque Country was the following: Vizcaya (75.4 per cent), Guipúzcoa (21.5 per cent), Alava (2 per cent) and Navarra (1 per cent). *Ibérica* at that time controlled only 38 per cent of consumption in Guipúzcoa (Garrués 1994).

¹⁹ Periods when the electricity companies and auto-producers had most problems with their production due to the low water levels in the local rivers.

TABLE 2
THE EVOLUTION OF *FENSA*'S AVERAGE SALE PRICES (1930-1946)
(Cents/KWh)

Year	Industrial	Domestic	Average	Year	Industrial	Domestic	Average
1930	8.8		8.8	1939	9.1	11.3	9.2
1931	8.2	12.3	8.6	1940	8.5	11.9	8.8
1932	8.4	11.9	9.3	1941			10.3
1933	8.8	11.3	9.2	1942			10.2
1934	9.1	11.1	9.2	1943	8.6	11.6	8.8
1935	8.6	11.9	8.6	1944	8.9	11.5	9.0
1936	8.9	12.2	9.4	1945	8.0	12.2	8.2
1937	8.6	11.6	9.0	1946	7.7	13.1	8.0
1938	8.7	11.4	8.8				

Source: Own compilation from consulting monthly entries in the General Ledger of *Fensa* (1927-1946) and the Annual Reports of *Fensa* (1930-1946).

TABLE 3
THE DISTRIBUTION OF *FENSA*'S AVERAGE INDUSTRIAL PRICES ACCORDING
TO DIFFERENT TYPES OF CONSUMPTION (1933-1943)
(Cents/KWh)

	A	B	C	D	E	F	Average
1933	8.5		8.6	10.4	11.4	21.9	8.8
1936	3.0	8.2	9.1	12.5	14.7	23.3	8.9
1939	6.2	10.4	12.3	11.7	18.4	26.9	9.1
1943	7.0		11.3	13.5	15.7	23.7	8.6

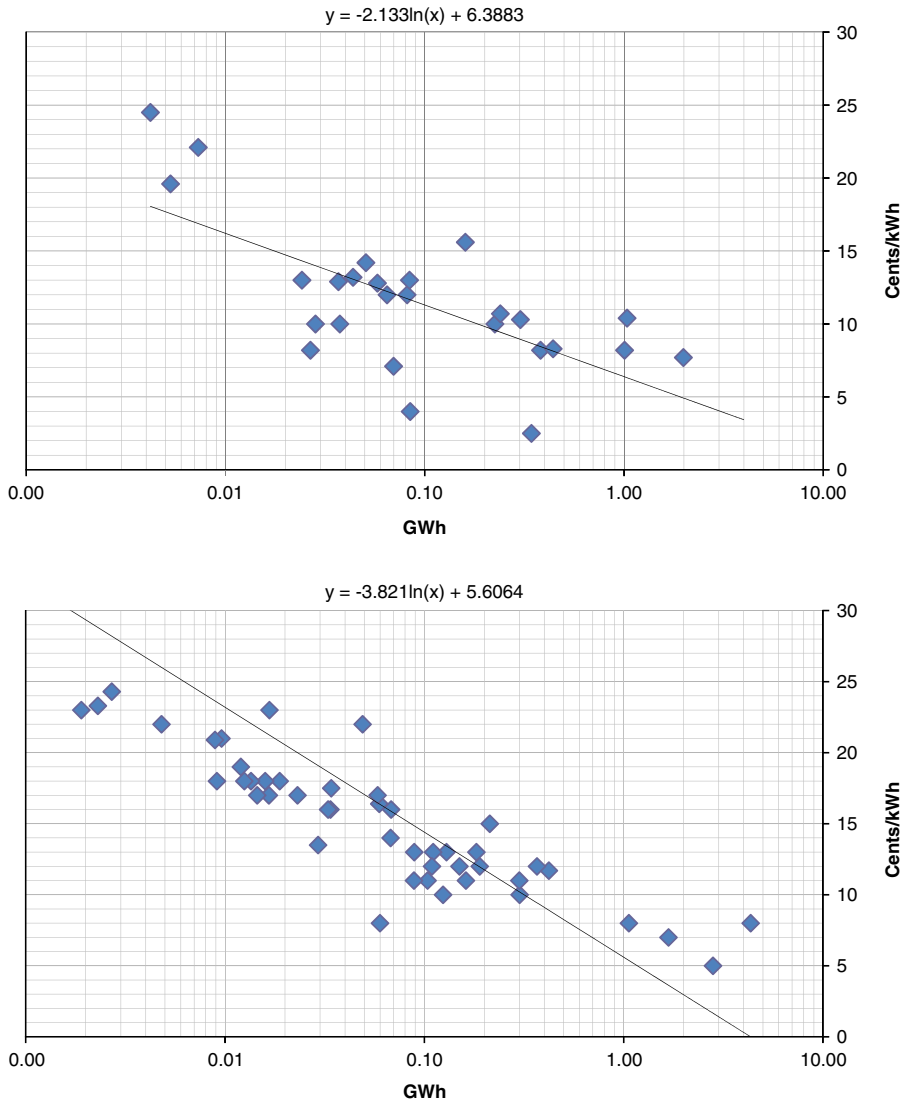
Source: as Table 2.

Key: A: >1,000,001 kWh; B: 500,001-1,000,000; C: 100,001-500,000; D: 50,001-100,000; E: 10,001-50,000; and F: 1-10,000.

a reduction in price), and that with the lowest consumption (which had an increase of 7 per cent), the other types saw their prices rise between 1933 and 1943 by more than 23 per cent.

If we take the analysis to a more detailed level, which relates the price and consumption for each client, we can highlight two facts (Figure 2). First of all, during the early years there was no strong relationship between the two variables, some companies received lower prices than others with a higher level of consumption. Therefore, along with the relationship of the lower

FIGURE 2
PRICES PAID BY *FENSA*'S INDUSTRIAL CLIENTS (1933 AND 1943)
(Cents and GWh)



Source: see Table 2.

rates to the greater consumers, other parameters need to be included. This is not strange if one remembers that *Fensa* wished to gain entry into markets that were competitive. The exclusivity of supply, the distance of the point of consumption from the site of production, the negotiating abilities of the agents and the prices offered by potential competitors, all had a lot to do with rates. The second aspect is that, once the distortions in average prices caused by the Civil War had been eliminated and *Fensa's* market had been defined, it was from 1943 onwards that it can be proven that rates were set mainly according to consumption levels rather than any other consideration. In fact, the companies that obtained the best prices (below 10 cents/kWh) were the cement factories, the electricity distributors and the paper companies, followed by a fairly small group of medium-sized clients (between 300 and 500 MWh), who paid between 10 and 12 cents/kW consumed. The vast majority of companies with low levels of consumption paid prices above 12 cents.

Another criterion that influenced price decisions was the seasonal nature of consumption. *Fensa* undercut the main market rates in periods of scarcity in summer and hours of high consumption and, to a lesser extent, for supplies dispatched in winter and off-peak hours²⁰.

In short, *Fensa's* pricing policy varied essentially in relation to certain aspects: (a) the total power contracted; (b) consumption; (c) the time of year, summer or winter; (d) the prices offered by other competing companies; (e) the unit profit necessary to cover costs, remunerate capital and carry out an adequate policy of repayments and investments. At the moment the absence of accurate information does not reveal the exact importance of these variables in the negotiations to set *Fensa's* selling prices and their renewal. However, in general, the electricity demand-charge rate structure (a and b variables cited) became, as happened in the United States with the industrial and large commercial customers, the principal criteria used to establish rates and introduce the principles of price discrimination. This policy was the second-best form of peak-load pricing and, certainly, was not carried out with the rates used for light and household uses (Neufeld 1987)²¹. In this type of consumption, where *Fensa* remained increasingly in competition with *Ibérica* and other companies, the main price discrimination criteria was to set rates below those offered by competitors (d)²².

There are two differences between *Fensa's* average prices in comparison with those of *Irati* and *Arteta*, two important Navarra companies (Table 4). The first is the relative stability of *Fensa's* prices throughout the period.

²⁰ For example, *Portland* and *Rezola* had to pay for winter power at 3 or 4 cents/kWh, respectively, and summer power at 9 cents/kWh.

²¹ A clear and comprehensive explanation of the «electricity demand-charge rate structure» and its implementation in Spain can be seen in Antolín (1988).

²² In the industrial market, except for several large consumers, *Ibérica's* interest in competing with *Fensa* must have been very weak. Among other reasons, because *Ibérica* would incur a high opportunity cost establishing the necessary infrastructure to distribute electricity to places that were relatively remote, disperse and with a complicated orography.

TABLE 4
IBÉRICA, IRATI AND FENSA PRICES ACCORDING TO DIFFERENT TYPES OF
CONSUMPTION
 (Cents/kWh and % of consumption)

	<i>Ibérica</i>		<i>Irati</i>		<i>Fensa</i>	
	1935		1937		1935	
	Cents/ kWh	%	Cents/ kWh	%	Cents/ kWh	%
Low-voltage	30.1	13.3	26.2	28.3	11.9	0.7
Lighting and domestic uses	42.5	6.7	34.8	12.6		
Public	23.7	1.4				
Residential	59.8	2.9				
Fixed-base rates	33.6	1.8				
Domestic uses	30.0	0.5				
Industrial	17.6	6.6	15.0	15.7	11.9	0.7
High-voltage	7.5	86.7	3.4	71.7	8.6	99.3
Distribution companies	9.4	8.8			9.1	9.4
Traction	7.9	18.9	11.2*	8.2		
Electrochemical and electro-metallurgy	6.9	4.7	1.5*	55.4		
Industrial	7.1	54.3			8.3	89.9
Cement and paper industries	8.2		8.5	8.1	7.3	20.1
Altos Hornos de Vizcaya	5.2					
Total	10.5	100.0	9.2	100.0	8.6	100.0

Note: *Own consumption.

Source: as Table 2.

This was because its structure of consumption was perfectly defined, basically industrial consumption, while in the other two companies it was more complex and dynamic; lighting and industry in Pamplona, plus its own consumption in the case of *Irati*. The second difference is seen in the fact that *Fensa's* prices were lower due to the nature of its production, capacity to store energy and the competitiveness of its market.

The competitiveness of the Navarra company is obvious if its prices are compared with those of the other companies from Guipúzcoa and Vizcaya (Table 5). After 1934, *Fensa's* average prices were lower than those

TABLE 5
AVERAGE PRICE OF ELECTRICITY FOR *FENSA*'S MOST IMPORTANT CLIENTS, AND FOR OTHER COMPANIES OPERATING IN
THE VASCO-NAVARRO MARKET (1930-1946)
(cents/kWh)

			Prices offered by <i>Fensa</i> to:																				
	Cement companies		Paper manufacturers						Distributors								Average prices of other companies						
Year	CP ^a	CR ^b	JE ^c	PA ^d	JC ^e	RAC ^f	EGC ^g	PP ^h	Ebch ⁱ	EC ^j	CESS ^k	ER ^l	Ebi ^m	Eber ⁿ	Arit ^o	<i>Fensa</i> ^p	<i>Arteta</i>	<i>Irati</i>	<i>Ibérica</i>	<i>Duero</i>	<i>Guip</i> ^q	<i>Irurak</i>	<i>Bilbao</i>
1930																7,4	12.5	8.5	6.9				
1931	8.8		8.1							5.9				13.0		7.3	11.3	9.2	6.9				
1932	7.8		8.2		8.2		13.0		10.4	4.0	12.0	10.0	10.0	12.8		7.9	9.9	7.8	6.7				
1933	7.8	2.5	8.2		8.3	8.2	13.3		9.6	6.1	12.0	10.0	12.6	12.3		7.8	11.4	9.3	6.7				
1934	7.7	2.8	8.2		8.3	8.2	10.3		10.2	6.4	11.9	10.4	10.1	12.8		7.8	12.7	9.3	9.3				
1935	8.6	3.0	8.2		8.2	8.2	11.0		8.5	7.3		10.4	11.8	12.6		7.3	12.3	8.4	8.8	5.0	9.1	19.1	29.5
1936	8.0	3.0	8.2	6.9	8.2	8.4	10.7		9.9	6.8	9.7	10.4	13.0	13.0		8.0	11.5	6.3	9.1	7.9	9.5	21.8	28.8
1937	6.2	4.0	8.2	6.7	8.2	12.6	12.4	12.0	8.5	8.9	11.3	10.4	16.1	12.6		7.6	11.4	6.3	10.8	2.8	9.6	21.8	27.5
1938	9.0	5.1	8.2	6.8	11.9	12.4	12.3	12.0	10.0	8.0	7.9	10.4	10.7	11.5		7.5	11.5	6.8	9.7	5.0	9.8	19.8	27.6
1939		5.5	8.2	6.7	12.4	12.4	12.4	12.0	8.5	7.6	6.2	10.4	12.2	10.8	8.0	7.8	11.3	7.9	8.7	5.0	9.8	20.2	29.6
1940		5.3	8.2	7.0	12.3	12.4	12.4									7.4		8.9	8.3	8.0		27.8	
1941									10.2	9.9			10.7	10.0	9.1	8.7		9.3	8.6	6.9		26.0	
1942									10.2	9.9			10.7	10.0	9.1	8.7		10.0	9.6	7.4		23.2	

TABLE 5 (Cont.)

			Prices offered by <i>Fensa</i> to:																					
	Cement companies		Paper manufacturers						Distributors								Average prices of other companies							
Year	CP ^a	CR ^b	JE ^c	PA ^d	JC ^e	RAC ^f	EGC ^g	PP ^h	Ebch ⁱ	EC ^j	CESS ^k	ER ^l	Ebi ^m	Eber ⁿ	Arit ^o	<i>Fensa</i> ^p	<i>Arteta</i>	<i>Iratí</i>	<i>Ibérica</i>	Duero	Guip ^q	Irurak	Bilbao	
1943		5.0	8.2	6.7			11.1	12.0		8.0		10.0	12.0	11.0	8.0	7.8		11.0	9.1	8.0		24.6		
1944		5.0	8.0	7.0			11.0									7.6		11.3	11.5	6.9				
1945										8.0		10.0		11.0	8.0	7.0		11.9	11.0	7.4				
1946		5.0	8.0	7.0			11.0		9.6	6.7	9.5	11.3	11.7	11.9	8.0	6.8		11.8	12.3	6.1				

Source: For Fensa prices, see Table 2; for the other companies see Sources in the bibliography and the Annual Reports of each company cited.

Key: ^aCementos Portland; ^bCementos Rezola; ^cJose Echezarreta; ^dPapelera Aralar; ^eJosé y Cía; ^fRuiz, Azcarate y Cía; ^gEchezarreta, G. Mendía y Cía; ^hPapelera de Portu; ⁱElectra Berchin; ^jElectra Carcar; ^kCía Eléctrica de San Sebastián; ^lElectra Recajo; ^mElectra Bidasoa; ⁿElectra Berrueza; ^oElectra Aritzacun; ^pIn this table, average prices take into account the electricity distributed; ^qDistribuidora Eléctrica Guipúzcoana. In the rest of the tables of Fensa prices, however, the electricity taken into account is that which was consumed.

of *Ibérica* and those of its most important subsidiaries²³. In this advantageous situation for distribution, *Fensa* was able to cover its limited production capacity by seeking alliances with other producers (such as *Salto del Duero*) and endangering the future influence of *Ibérica* in this unorganised market. On the other hand, the fact that the average prices of the *Ibérica* distributors in Guipúzcoa compared favourably with those of its distributors in Vizcaya was due to the monopoly exercised by *Ibérica* in the Vizcaya market, the type of clients reserved for the distributor in this market, generally low-voltage customers, and the lower level of energy produced by the company itself. The fact that *Fensa's* prices, except during the Civil War, appeared not to be very different from even those of a young, important production company like *Salto del Duero* shows, once more, its competitiveness through prices and corroborates that the takeover of *Fensa* was closely related, in the first place, to its limited production resources and, as a consequence of this, its limited capacity to respond to the post-war restructuring of the Spanish electricity market.

While being aware of the fact that the average selling price of electricity can provide some indirect knowledge of its evolution, the most appropriate analysis to determine pricing policy in comparative terms requires a disaggregated study as made possible either by categories of consumption (lighting, power, traction) or types (high- and low-voltage supplies)²⁴. *Fensa* offered more competitive prices than *Ibérica* especially in high-voltage supplies to paper and cement companies (the most important segment of its consumption) and to a lesser extent to distribution companies. The price advantage over low-voltage industrial supplies was not very relevant in terms of consumption for *Fensa* (Table 4).

3. FENSA'S CONTRIBUTION TO THE FORMATION OF THE VASCO-NAVARRA ELECTRICITY MARKET

The formation of *Fensa's* market is of interest in two senses. First, the fact that it was established relatively late at a time when the development of the Spanish electricity sector was quite advanced. Second, due to the strategic value it acquired for two large Spanish companies (*Hidroeléctrica Ibérica* and *Salto del Duero*²⁵) in the control of the Vasco-Navarra market.

²³ Before this date, the prices offered by *Fensa* were higher than those of *Ibérica* for one main reason: its expansion in Guipúzcoa, intended to supplement the energy supply of a small group of industrial customers, was not allowed to conflict with the plans drawn up by *Ibérica* in this province. This situation of mutual respect had to change precisely when *Fensa* reached an agreement with *Compañía Eléctrica de San Sebastián* (1933) and *Electra Berchín* (owner of the *Compañía de Tranvías de San Sebastián*), two companies that provided light and low-voltage power to the heart of the province, its capital.

²⁴ Another alternative would be to compare the individual company rates.

²⁵ To properly understand the business context it is helpful to read Díaz Morlán (2006).

3.1. The first steps

Although the demand for electricity in Guipúzcoa during this period increased, we can assume that the existing companies were not very happy about the entry of a new operator into the market. The possibility that *Ibérica*, the main producer in the region, would stop the *Fensa* project was unlikely. Among other reasons, this was due to the exploitation of the *Alloz* reservoir, which was included in the new water policy of the State, with the support of the Hydrographic Confederations whose intentions were to re-launch the country's economic growth by fostering the development of multi-use dams related to agricultural irrigation and industrial electrification activities (see also footnote 21). The consumers must have had a different opinion. In principle, they would benefit from the price war that this new situation would generate, as well as from the extended and more specific supply.

The policy of *Fensa* up to the start of the Civil War was to give preference to the Guipúzcoa market, focussing on the capture of three areas of this market: (a) industries of a considerable size; (b) electricity companies; and (c) certain town councils. The Navarra company had a strategy that was similar to that displayed by the country's large electricity companies: to place its high-voltage production rapidly by way of contracts with large clients, thereby externalising the costs of distribution at low tension to the medium-sized local companies²⁶.

3.2. Relationships with the Guipúzcoan distributors and the first contacts with *Ibérica*

Fensa multiplied its contacts with different Guipúzcoan electricity companies and, in June 1931, it began talks with *Ibérica* to try to avoid any competition that would be damaging to either party. It should be remembered that one of the preferred objectives of *Ibérica*, after the appearance of the largest electricity-generating company in the country (*Salto del Duero* and the signing of the *Pacto de Auxilio Mutuo* with the *Grupo Hidroeléctrico-Hydro Group* in 1930²⁷), was to reinforce its production and financial position in the Guipúzcoa market. The approach by *Fensa* was brought to a successful conclusion by way of sporadic interchanges of electricity with *Ibérica*'s most

²⁶ In the provincial market, *Fensa* signed its first contract for the sale of electricity with *Cementos Portland* in 1930, and it began negotiations with a number of local Navarra councils. This electricity was mainly used for public and domestic lighting and, to a lesser extent, for the supply of rural industries. The initial idea of setting up their own subsidiary distributor in Navarra for this purpose, as defended by the prestigious Spanish publicist and *Fensa* engineer Errandonea, was not put into practice. The company preferred to sell its electricity through small local distributors. This probably happened because the rationalization of distribution proposed by Errandonea, whilst profitable in the long term, required major investment in the short term and did not offer sufficient guarantees of profits in the medium term, given the geographical spread and level of consumption in this rural market.

²⁷ Annual Reports of *Hidroeléctrica Ibérica*, 1930, pp. 7-8.

important subsidiary in Guipúzcoa, the *Distribuidora Eléctrica Guipúzcoana*, and with one of the oldest companies in the capital, the *Compañía Eléctrica de San Sebastián*. Later, in 1933, the desire to consolidate relations with *Ibérica* through a project of minimum rules of exchange failed when the latter did not accept the conditions imposed by *Fensa*. Two years later, encouraged by substantial changes in the Vasco-Navarro market due to the agreement signed by *Duero* and *Hydro Group* (1934), the latter two companies signed a contract (21/10/1935) pending the approval of *Duero*. Meanwhile, partial agreements were formalized for the adjudication of new supplies, but this was not without tension between the respective distributors when defining prices and markets.

After 6 months of deferments, *Fensa* denounced the contract with *Ibérica*²⁸, given that *Duero* did not ratify it. The Navarra company left and did not comply with its obligatory annual minimum consumption (2 GWh) or the parts of the agreement regarding rates, zones and link-ups. However, 2 months later, talks resumed, perhaps with the intention of qualifying certain matters established in the 1934 Agreement between *Duero* and *Ibérica*, which could have been an obstacle to the agreed contractual terms. *Fensa* expressed the following desires to *Ibérica*: (a) complete liberty to build its second hydropower station; (b) that the prices offered by *Ibérica*'s distributing companies should be the same or higher than those offered by *Fensa*; (c) freedom of consumption during peak hours and a minimum price for the obligatory quota.

3.3. The interconnection with the Basque network: *Fensa*, from independent company to distributor for Iberduero

Why didn't *Duero* endorse the agreement between *Ibérica* and *Fensa*? The reply to this question is of great interest in understanding part of the new structure of the market in the north of the Peninsula. The appearance of *Duero* (the largest Spanish producer with no specific market of its own) on the scene not only affected the large north-west and south-east Spanish utilities, who were obliged to defend the *status quo* with the 1934 Agreement, but also much smaller ones, like *Fensa*, which had found a niche in the gaps of the TES. Consequently, *Ibérica* put pressure on its distributors to increase their consumption and strengthened its relationship with *Compañía Eléctrica del Urumea* and *Eléctrica de San Sebastián*. However, in addition to these common effects suffered by medium-sized and small companies²⁹, the case of *Fensa* presented an additional peculiarity. This singularity was the result of the strategic position *Fensa* occupied for certain companies (*Duero* and *Ibérica*) as an instrument of penetration or as an obstacle to conquering the dynamic market of Guipúzcoa.

²⁸ Records of *Hidroeléctrica Ibérica*'s Board of Directors (from now on RHIBD), 15/04/1936.

²⁹ Disputes over other adjoining markets (*Electra Recajo*, *Hidroeléctrica Moncayo*, *EIA* and *ERZ*) were also common in these years. RHIBD, 31/01/1936, 15/04/1936, 12/07/1937, and 02/12/1940.

Duero, despite having reached an agreement with *Ibérica* over the sharing out of a large part of the market in the north of Spain³⁰, knew that the production situation of its partner was not ideal for effective control of this market³¹. For this reason, although *Duero* was not in a position to demand this, neither would it favour the development and consolidation of *Ibérica* in these markets, because it did not want to strengthen *Ibérica*'s negotiating position. In this way, *Duero*'s refusal to approve the agreement between *Ibérica* and *Fensa* acquires its real significance. The result was that *Duero* would halt the expansion of *Ibérica* in important markets, Guipúzcoa and, to a lesser extent, Navarra, and would open the possibility of them entering these markets.

Two years after the end of the Civil War, on February 26, 1941, as *Ibérica* tried to set up a sole distributor to avoid competition in Guipúzcoa, *Fensa* resumed contacts with *Ibérica* and its subsidiaries (*Distribuidora Eléctrica Guipúzcoana* and *Compañía Eléctrica del Urumea*). However, as *Fensa* would not yield to the desires of *Ibérica*, in relation to the exchange of shares, and the price and quantity of the supply, the attempt failed. In 1943 the two companies got together again, at the request of *Ibérica*, to bring order into the Guipúzcoa market. This is hardly surprising considering that, according to *Ibérica*'s board of directors: «the competition between the companies was great, and the abuse of the customers reached unsuspected heights»³²; apart from the economic burden that the electrical restrictions were causing to their balance sheets. But given that almost all of the solutions depended on the blessing of *Duero*, *Fensa* had no alternative but to sign a contract with that company to «share and supply» (16/2/1944)³³. The model of this contract was consistent with the commercial policy designed by *Duero* in 1932. This consisted of placing enormous quantities of energy in its «own markets» for distribution, as occurred in Castilla (Amigo 1992), through distributors in which it had a shareholding, as opposed to the idea of setting up a subsidiary for this purpose. In addition, *Duero* became the largest shareholder in *Fensa*, holding one-sixth of the paid-up capital, and *Fensa* became just one more distribution subsidiary.

Having reached this point, it is necessary to ask two questions. The first concerns the reasons that would explain the interference by *Duero* in the areas shared with *Ibérica*. The second question concerns the reasons why *Fensa*

³⁰ Under this agreement, the latter company would control the distribution exclusively in the provinces of Vizcaya, Alava, Guipúzcoa, Navarra, Logroño and the north of the province of Burgos. The Spanish market was divided into exclusive markets for *Duero*, *Ibérica* and *Española* and markets shared with *Duero* (by *Viesgo*, *Ibérica*, *Española*, *Alberche* and *Castilla*). In the latter, *Ibérica* acquired a quota from *Salto* and when it finished the increases in consumption were split between *Salto* and *Ibérica*.

³¹ In fact, in August 1939 and 1941, the directors of *Ibérica* gave sweeping powers to its chairman and his manager to make whatever efforts were necessary to sign agreements with respect to the Guipúzcoa and La Rioja markets, respectively. RHIBD, 28/08/1939, 26/01/1940, 16/05/1941, 25/08/1941 and 19/09/1941.

³² Annual Reports of *Hidroeléctrica Ibérica*, 1942, p. 6.

³³ RFGM, 23/03/1944, pp. 76-91.

became a subsidiary of *Duero*. As has been indicated on another occasion when explaining the formation of the Vasco-Navarro market (Garrués 1994), the replies to both questions should be analysed in the light of the effects of the agreement in 1942 between *Salto*s and *Ibérica* (Convenio 1942), which, substituting the document signed in 1934, reflected the new balance of forces existing between the two companies. Among other reasons, the 1942 Agreement meant a greater liberalisation of the market, implying the entry or participation in the market of a new producer (*Duero*) in those areas of intensive electricity demand that had previously been under the influence of *Ibérica*, but which it had not actually controlled. In exchange, *Ibérica* would be able to expand its production capacity through new facilities in order to deal with increases in consumption and put an end to the supply restrictions. *Duero* managed to «sell directly, using our own means of production, to high-voltage clients of their markets, a quantity of electricity equivalent to half of the total increase»³⁴. From this we can understand *Ibérica*'s loss of power in the Guipúzcoa, Navarra and Rioja markets, and the reason why *Duero* acquired distribution subsidiaries in markets that up to that time had been the domain of *Ibérica*, and, in this particular case, the strategic importance of *Fensa*.

The complex relationships were made more transparent after the birth of the largest Spanish electricity company, *Iberduero* (30/9/1944), a result of the merger between *Ibérica* and *Duero*. From this moment onwards, the sharing out of the market between different subsidiaries and/or parent companies would not take any longer than strictly necessary. The directors of *Fensa*, in almost all the meetings held in Bilbao with the board of *Duero*, showed great concern over the effects on its future of the birth of *Iberduero*, and in particular, over the validity of the 1942 Agreement. The board of the new company, however, managed to transmit the necessary reassurance. The proof of this is seen in the fact that in November of that year their networks were interconnected in a permanent way.

There were two consequences of the creation of *Iberduero* that were particularly important for *Fensa*, as will be explained later. These were: (a) the loss of autonomy in management, although for purely financial motives it survived as a subsidiary until 1991. Also as a result of this first consequence, (b) its new operative and commercial policies, now exclusively as a distribution company, directed at the organisation of the electricity markets in the centre and south of Navarra, ceding its traditional markets in Guipúzcoa and the north-west of Navarra to the parent company.

3.4. The agreement with *Salto*s del *Duero* (1944) and the first actions as a subsidiary

The directors of *Fensa* justified the «*Share and Supply*» agreement (16/2/1944) with *Duero* to their shareholders as the only way to avoid the company's

³⁴ Annual Reports of *Salto*s del *Duero*, 1942.

supply problems. The agreement was signed with *Duero* because it was the only company that would be able to offer the necessary supply guarantees. In effect, *Duero* said it would respect the industrial business of the Navarra company and offered a minimum quota of auxiliary energy (6 GWh) at a reasonable price, as long as they held «control of *Fensa* (...) to avoid future competition, always disastrous to the interests of the companies»³⁵. Although this control did not imply the dissolution of the company, it came at a great price: *Duero* became its major shareholder.

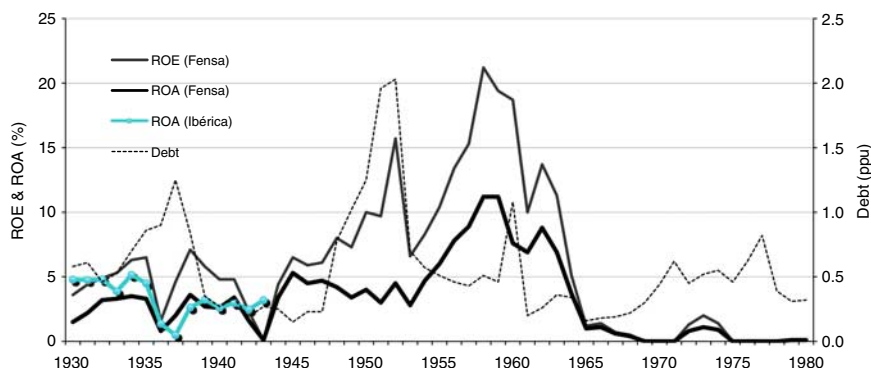
As for the supply contract, *Fensa* had discretionary power over the distribution of the maximum quota that *Duero* had the right to commercialise in Guipúzcoa, Navarra and Logroño with the exception of the major consumers (10 GWh p.a.) who were served directly by *Duero*. The duration of the contract was conditioned by the 1942 Agreement between *Duero* and *Ibérica*, in other words until January 1, 1958. To *Fensa*, to have energy with no obligation in relation to minimum consumption periods (low water levels or winter), nor time (peak hours), meant it could count on a supply of permanent electricity in greater quantities than thermal energy, and at a cheaper price than hydro. In addition, this contract had the advantage of favouring the sale of *Fensa*'s own production as constant energy, with the consequent improvement in sale prices, and guaranteed services of supply. The change in the composition of the shareholders would matter little or not at all to the directors and shareholders of *Fensa*. This was because they would be guaranteed the continued value, as opposed to the risks of a renewed market, where competition through production and prices could lead them to a progressive decapitalisation³⁶.

With the appearance on the scene of the new company, *Iberduero* occupied itself with the reorganisation of the Guipúzcoa market, leaving *Fensa* in charge of restructuring its southern market. With this intention, in September 1946 *Fensa* acquired *Electra Pamplona*, an old *Ibérica* subsidiary, in exchange for its distributive and productive elements (*Saltos de Ituren* and *Electra Aritzacun*) in Guipúzcoa. With this exchange of assets, *Iberduero* went from controlling one-sixth of *Fensa*'s capital to having more than 50 per cent of its shares. It was then that *Iberduero* changed the articles of incorporation of *Fensa*, reducing the power of its board of directors and modifying its traditional way of sharing profits.

³⁵ RFB, 4/03/1944, p. 104.

³⁶ The agreement between *Saltos* and *Fensa* allowed the latter company to maintain its traditional structure of dividends: 5 per cent to capital reserves; 10 per cent to the board of directors; up to a maximum 7 per cent of capital invested by shareholders; and the rest as decided by the General Meeting of Shareholders. It should be noted, however, that the downward trend of *Fensa*'s dividends between the end of the Civil War and 1944 (4 per cent in the last year) contrasted with the positive evolution of other companies like *Saltos* (6.30 per cent in 1944) or *Ibérica* (6 per cent in the same year; Appendix 2).

FIGURE 3
EVOLUTION OF *FENSA*'S RETURN ON ASSETS (ROA), RETURN ON EQUITY (ROE)
AND DEBT 1930-1980 (%)



Source: see Appendices 1 and 2

4. ECONOMIC PROFITABILITY

It can be stated that the return on *Fensa*'s assets (ROA) improved when the company became integrated into the *Iberduero* system (Figure 3)³⁷. The variations in factors of an industrial nature (initially due to financial costs³⁸ and, later, due to those arising from productive insufficiencies³⁹), compared with a relatively stable commercial factor (sale prices) and a less than efficient management of assets (among other reasons, due to the delays suffered

³⁷ For a more detailed analysis, see Garrués (1996, pp. 740-749).

³⁸ Financial expenses were increased from 1934 to 1940. Up to 1934 the company's finance had been based largely on self-financing (based on increasing the capital share in 1928). Thereafter, the expenses incurred by the electricity infrastructure, the recovery of *Hidroeléctrica de Allos* foundation obligations and bond investments in subsidiaries to restructure (*Ituren* and *Aritzacun*) demanded that *Fensa* also use long-term and short-term external financing (through 5,000 mortgage bonds in 1934 and 2,000 in 1937). This meant a significant increase in annual interest rate and depreciation. The situation was corrected, however, by taking advantage of the fact that new funds were needed to build the second waterfall and to alleviate the debts incurred they resorted to self-financing again (a capital share increase of 6 million pesetas in 1939, 8 million in 1940 and 10 million in 1942).

³⁹ The downturn in the ROS (rate on sales) was due, on the one hand, to a combination of relatively low electricity prices and rising costs. Within the latter were the especially burdensome costs of purchasing power from third parties. This issue was closely linked to the evolution of demand and the gradual strangulation of its own production, rather than the possible variation in the prices of purchased energy. In no case did it exceed 7 cents/kWh. The purchase of electricity between 1938 and 1944 was increased by 6 per cent, constituting by the latter date, 60 per cent of the total expenditure.

in investments becoming productive⁴⁰), explain the limited and unequal development in profitability in the first phase (1930-1944).

In the second half of the 1940s and the early-1950s (1945-1953), by then as a subsidiary of *Iberduero*, profitability did not improve substantially because the restructuring of the Navarra market (the takeovers of *EP*, *HM*, *HCV*, *Evz*, *ET* and *EE*) had a high cost for the company⁴¹. The greater development of ROA in the third stage (1954-1959) was due, in part, to the fact that *Fensa* managed to improve its profits per unit (TTUs and financial reorganisation⁴²), and also because it achieved a more adequate management of its assets. This positive evolution should have been maintained in the last period (1960-1980), but the takeover of *Irati-Arteta*⁴³ (1961) and, above all, the new policy of *Iberduero* in relation to the self-financing of *Fensa*, which reduced declared profits to a minimum, did not help to specify the development of this variable adequately⁴⁴.

The development of *Fensa* was financed with its own capital, which gave it acceptable levels of solvency and indebtedness (Figure 3). *Fensa*'s financing was not as advantageous as that of certain large companies like *Ibérica* or *Hidroila*, which, having the financial support of large banks from the beginning, could make financing more intense, agile and less costly in terms of the use of credit, and even in the handling of bonds⁴⁵. Unlike large companies, the difficulties in obtaining finance capital made *Fensa* prefer very conservative financial policies based on equity capital (capital increases). Meanwhile, *Ibérica* made a relatively greater use of credit, while *Hidroila* opted for the use of bonds⁴⁶. The consequence of *Fensa*'s conservative policy was a reduced capacity for risk-taking and new investment and, ultimately, a greater dependence on and vulnerability to the growing competitiveness of the large companies.

⁴⁰ The results of 1943, for example, demoralized the *Fensa* board of directors, especially when they saw that more than 50 per cent of capital invested in the construction of the second power station had not begun to offer results.

⁴¹ This explains the difference between the ROA and return on equity (ROE). Between 1947 and 1952, the long-term liabilities increased from 1.7 to 52.7 million pesetas while the capital share of the company was only 30 million.

⁴² Among others, it was important to increase the capital share in 1953.

⁴³ The takeover of *Irati-Arteta* required a capital share of 100 million pesetas. This increased from 60 to 160 million pesetas.

⁴⁴ This company, once it had completed its main task, the concentration of Navarra market and, above all, when *Iberduero* became its sole shareholder (1966), suffered a significant mutation. That is why *Iberduero* showed no interest in distributing profits according to the real business, especially when they had to pay significant taxes. *Iberduero*, taking advantage of regional and state legislation, consequently reduced its profits by increasing depreciation and reserves.

⁴⁵ Regarding the relationship between *Ibérica* and *Banco Vizcaya*, see Antolín (1996), pp. 251-252 and on the interconnection between *Hidroila* and diverse financial groups (*Banco de Vizcaya*, *Banco Central* y *Banco Hispano Americano*) and its impact in the business and financial strategy, see Aubanell (2000, pp. 155-162) and Tedde and Aubanell (2006, pp. 170-177).

⁴⁶ However, the relationship between equity capital and obligations in *Ibérica* and *Española* was very similar (1921-1929, 0.9 and 1930-1936, 1.7; 1938-1944, 3.0) (Antolín 2006; Tedde and Aubanell 2006). As expected this ratio was in favour of the equity capital (1916-30, 2.1 and 1937-1944, 5.3) in *Fensa*'s case (Garrués 1996).

Beyond this consideration, the analysis of the financial evolution needs certain clarifications.

As an independent company, growing financial demands forced it to resort to external capital. Although this did not endanger the company's solvency, it led it to worrying levels of indebtedness, especially between 1934 and 1938. This situation was corrected through three capital increases (1939, 1940 and 1942), which allowed it to reduce the imbalance in its financial structure and indebtedness, and also allowed it to commit to important investments in such a way that, although profitability in the first half of the 1940s was very weak, the same thing did not happen with its financial situation. Consequently, if the conversion of *Fensa* into a subsidiary of *Salto del Duero* was unavoidable, above all taking into account the medium-term economic situation, this was not the case from a financial point of view. This being so, the interest of *Salto del Duero* in acquiring the services of this company, apart from those mentioned in the reform of the Guipúzcoa-Navarra market, would only increase.

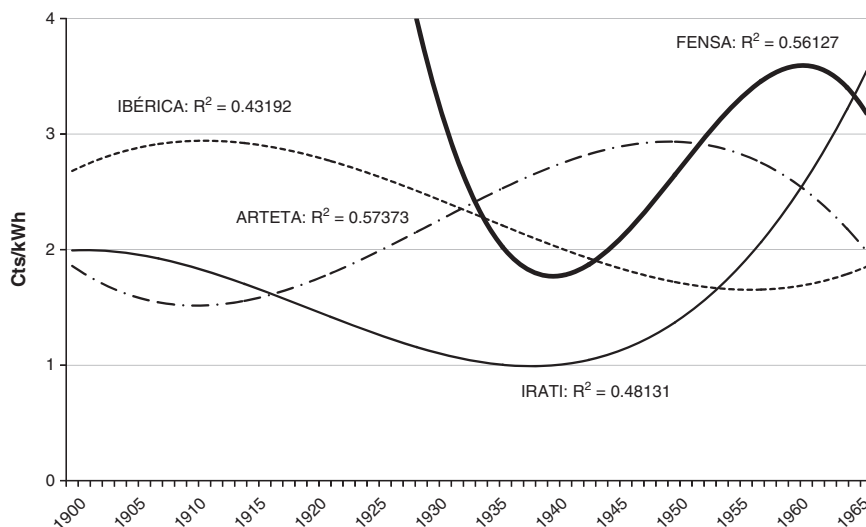
In the first years (1948-1958) as a subsidiary of *Iberduero*, *Fensa's* financial structure, solvency and indebtedness showed negative trends. This situation can be understood if one takes into account the cost that it had to pay, as a subsidiary, for the restructuring of its new market. From that time onwards, the financial situation of the company progressed without any major problems, as far as *Iberduero* allowed it a sufficient margin of operation to achieve a sufficient level of self-finance.

The comparison of the economic-financial situations of *Fensa* and *Ibérica* shows that, although from 1938 the profitability of the Navarra company was not very different from that of the company from Vizcaya and their commercial and industrial margins were comparable, their capacity for manoeuvre was radically different. *Ibérica* was in a phase of rapid expansion while *Fensa* was struggling to survive in the market. In addition, the financial behaviour of *Ibérica* indicates a stability that is not comparable in any way to that of *Fensa* because the slightest setback destabilised its accounts. It is hardly necessary to observe that, in contrast, the shareholding in *Ibérica* maintained by some of the most important financial institutions in the country gave the company a guarantee that the medium-sized electricity companies could not compete with. However, the evolution of costs speaks volumes. The crisis in the TES occurred when the unit costs of the small or medium companies (e.g. *Arteta*, *Fensa* and *Irati*) were higher than those of the larger companies (e.g. *Ibérica*; Figure 4).

5. EPILOGUE: INTEGRATION OF THE NAVARRA MARKET INTO IBERDUERO'S SYSTEM

The transformation of *Fensa* into a subsidiary of *Iberduero* meant a radical change in its development. On the supply side, within a few years it

FIGURE 4
EVOLUTION OF REAL UNIT COSTS OF *FENSA*, *IBÉRICA*, *IRATI* AND *ARTETA*
(1900-1965). POLINOMIC TENDENCY (Cents-1913-/kWh)



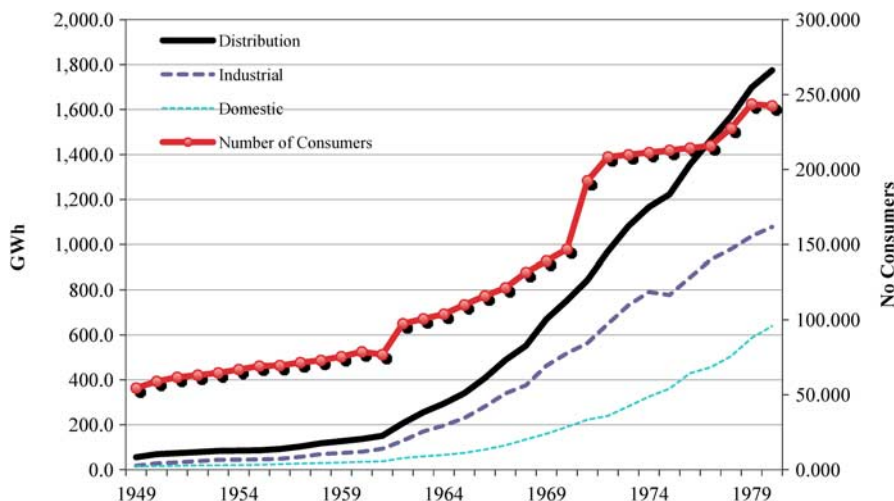
Source: see Appendix 1.

became the most important distributor in Navarra. In 1954, the electricity bought from *Iberduero* amounted to more than half of the energy distributed by *Fensa*, by 1980 it amounted to almost 100 per cent (Figure 5). The acquisitions of energy before the 1970s were marked by a strong increase in demand on the TES, which could not be satisfied by the as yet unconsolidated integrated systems. From that time onwards, the growth in energy bought by *Fensa* evolved at a rate imposed by the needs of the consumer market. The development in its own production, after its *Mañeru* hydropower station came on line (1944), was due to the incorporation of production and distribution assets that *Fensa* was absorbing⁴⁷ and to the greater rationalisation of generation, the automation of hydropower stations, of transport and of the commercialisation of the electricity supplied to the network.

As part of this idea of optimisation, *Fensa* improved the lines of transmission that supplied the important nuclei of consumption, adjusting them to the same voltage as *Iberduero*'s system. It managed to eliminate two of the

⁴⁷ Among others: *Electra de Pamplona*, 1946; *Hidráulica Moncayo*, 1948; *Hidroeléctrica Cinco Villas*, *Electra Vozmediano* and *Electra Turiano*, 1949; *Central de Añón*, 1950; *Electra Estellesa*, 1951; *Alfaro Hnos. y Vda. de Gambarte* and *Sdad. de Maderas*, 1962; *Hidráulica Urederra*, 1965, etc.

FIGURE 5
EVOLUTION OF ELECTRICITY DISTRIBUTED AND CONSUMED IN *FENSA'S* MARKET (1947-1980)



Source: Appendix 1.

evils that had long affected almost all of the TES, that is to say losses in distribution and consumer fraud.

The process of modernisation also affected *Fensa's* own means of production. From the mid-1960s, hydropower stations were automated, new groups and sub-stations were installed and the capacity of others was increased. In the 1980s, *Fensa* undertook the recovery of the micro-power stations paving the way for the agreement signed between the Administration and Unesa in 1981. In Navarra the task of recovering the micro-power stations fell to a new company, *Energía Hidroeléctrica de Navarra* (EHN).

The evolution of energy consumption in *Fensa's* market closely followed the same tendency noted in the evolution of energy distributed. With the passage of time, and the extent to which transmission and distribution losses were notably reduced, they converged⁴⁸. The level of consumption grew continually from the 1950s to the time of the first oil crisis (14 per cent), when it suffered a strong setback, above all in industrial consumption (Appendix 1).

⁴⁸ The loss went from 30 per cent of energy distributed in the late-1940s, to just 5 per cent in the early-1980s.

The rapid increase of the 1950s and 1960s was not produced merely by the rate of industrialisation and urban development in the province, but also by the dramatic expansion of *Fensa* through the absorption of other companies. With respect to the territorial extension, in 1965, for example, the electricity used by its clients amounted to ~72 per cent of the total consumed in Navarra. As for the intensity of consumption, that the majority of the electricity was distributed at low voltage confirms the company's known role as a distributor. In any case, the evolution of consumption proves the fact that industrial and urban development in the 1950s and 1960s underwent a strong boom, echoing its course of the first third of the century. The growing importance of industrial consumption, compared with domestic and agricultural consumption, gives an idea of the industrial dynamism of those years. Whilst in 1950 industrial use amounted to 50 per cent of total consumption, 13 years later it came to 71 per cent.

There is no doubt, in this sense, that had Navarra continued to be restricted exclusively to TES, it would have been left behind in the first great wave of industrialisation in post-war Spain, and its inhabitants' standard of living would have been adversely affected. That this is so does not mean that the TES did not play a hugely important economic role, although not all reached the level of efficiency of some regional integrated systems.

6. CONCLUSIONS

In the Spanish electricity sector, as in the majority of other European electricity sectors until their nationalisation after the Second World War, large companies co-existed alongside what are called TES. With the spread of high-voltage transmission, the TES gradually disappeared as the large companies benefited from huge economies of scale and network, typical of the first IES. The establishment and market domination of the large companies was a process that in some countries, like Spain, was relatively slow. Thus, the benefits of this new industrial organisation came once the main technological and construction restrictions had been overcome after the First World War. The importance of the TES, however, should not be restricted exclusively to the peripheral areas or those that were economically less developed. In Spain, deficient government regulation (Pueyo 2006, pp. 63-111; Cayón 2009) and collusive agreements between firms allowed the large companies to renounce their natural territorial expansion because they preferred to externalise the high costs of distribution-commercialisation to TES companies.

Within the small- and medium-sized electricity companies, the case study of *Fensa* provides a good number of suggestive contributions to consider from three different viewpoints: (a) the business strategy, observed through the decisions taken by its directors; (b) the industrial organisation, seen through its behaviour in a situation of transition to the establishment of the

first oligopolistic integrated system, previous to the current structure of the market; and (c) the level of regional development.

(a) The birth of *Fensa* shows how in provinces with limited industrial development (e.g. Navarra), it is possible to recognise outstanding business initiatives. This was because it was capable of constructing a lucrative and relatively novel business starting from an idea that had previously failed (*Hidroeléctrica de Alloz*). In fact, by way of applying the latest technology available on the construction of dams (dome type), it was able to make use of the hitherto unused water resources available (the River Salado). In contrast to the Spanish electricity companies of the time (which managed to enter the business due to the unrivalled strength provided by a solid financial support base and enormous quantities of energy, e.g. *Ibérica*, *Hidrola* or *Salto*), *Fensa* entered the business with the backing of the regional middle class and with differentiation of its product: the kilowatts that it sold during periods of low water levels.

(b) From the industrial organisation viewpoint, *Fensa* had the advantage of operating in a very dynamic industrial market (Guipúzcoa), which was still barely controlled by *Ibérica*: the large Basque company that was capable of imposing, when its production surpluses permitted, its monopolistic power. This situation occurred with the opening of the second exploitation that *Ibérica* constructed in the Pyrenees (42,000 kW) in 1932 (Antolín 1989, 2006; Garrués 1994). However, the dramatic effect of the appearance of the largest Spanish producer without its own market (*Salto del Duero*), due to its exploitation of the *Ricobayo* waterfall (88,000 kW), changed the Spanish electricity panorama. In fact, the efforts of *Fensa* to reach an agreement with *Ibérica* that would allow it to increase its production and avoid damaging competition (the 1935 contract) were unsuccessful. This was because *Fensa*, like many other companies from the TES, became a pawn in the game of alliances designed by the large companies. The agreements signed between the *Hydro Group* and *Salto* (1934 and 1942/1943) to share out the Spanish market, with the exception of Catalonia, Galicia and Andalusia, were a good example. In the hidden confrontation between *Duero* and *Ibérica* to acquire the largest share of so-called «shared markets», *Fensa* became a key element for control of these markets. This was because it was the only strategically important and independent company in the Guipúzcoa and Navarra markets. For this reason *Duero* did not accept *Ibérica*'s contract with *Fensa*, and the latter company, captive to its productive limitations during the period of restrictions, became its subsidiary.

In reality, by this stage in the development of the Spanish electricity system, the survival of the TES had become more and more difficult. The market power exercised by the large companies (based on their productive and financial superiority) was way beyond any possible strengths of any of the traditional companies that, like *Fensa*, had stood out for their productive specialisation, competitive pricing policy and reasonable profitability. With the appearance of *Iberduero* (from the merger between *Duero* and

Ibérica), *Fensa's* role, as its distribution company, was to organise and modernise the Navarra market. This task lasted until well into the 1980s.

(c) As far as regional development is concerned, *Fensa* contributed in a decisive way. First, it alleviated the electricity shortages and intensified electrification in one of the most industrially dynamic provinces of Spain (Guipúzcoa) during the 1930s and 1940s. Second, *Fensa* contributed as a distributor for the largest hydroelectric company in the country by integrating the old TES in Navarra into *Iberduero's* electricity system. This meant that the electricity supply problems would not be a hindrance to the important economic takeoff of Navarra's industry in the second half of the 20th century.

Despite what has been said, and in contrast to other countries⁴⁹, in Spain the development of the medium-sized and small companies remained an unresolved problem. This is the case because without government regulation, which would defend their status, they were left defenceless against the expansionist logic of the large companies. In fact, at the beginning of the 1980s when they could have benefited from the new structuring of the electricity business (Garrués 2010) (according to free market principles and the setting up of the state transmission company, REE; Garrués and López 2009), it was already too late. Most of the companies had disappeared, or in the best of cases were no more than oddities of industrial archaeology. For this reason TES have not received the attention they merit in economic history. Without doubt, this case study and comparative analysis will help to display the complexity of the subject and will provoke future debate.

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APPENDIX 1

CLIENTS, PRODUCTION, CONSUMPTION, FINANCIAL RATIOS AND UNIT COSTS OF *FENSA* (1930–1980)

	Clients	Production			Consumption			Economic financial ratios					Real unit cost			
Year								<i>Fensa</i>			<i>Ibérica</i>					
		Own	Acquired	Distributed	Total	Industrial	Domestic	ROE	ROA	Debt	ROE	ROA	<i>Arteta</i>	<i>Irati</i>	<i>Ibérica</i>	<i>Fensa</i>
	No. from 1949 (thousands)	GWh			GWh	%		%		ppu	%		Cents/kWh @ 1913 value 3 year average			
1930	(2)	2.8		2.8	2.4	94	6	3.6	1.5	0.6	10.7	4.8	2.2	1.4	2.1	
1931	(13)	4.6	0.2	4.8	4.1	91	9	4.4	2.2	0.6	12.8	4.8	2.3	1.4	1.9	1.8
1932	(15)	5.2	1.4	6.6	5.6	76	24	4.9	3.2	0.5	10.4	4.8	2.4	1.5	1.9	2.1
1933	(26)	7.7	1.8	9.5	8.1	84	16	5.3	3.3	0.5	6.7	3.9	2.9	1.5	2.2	2.5
1934	(29)	11.4	2.3	13.7	11.6	94	6	6.3	3.5	0.7	8.9	5.1	3.3	1.5	2.5	2.7
1935	(50)	11.9	2.9	14.8	12.5	98	2	6.5	3.3	0.9	8.2	4.5	3.4	1.3	3.2	3.2
1936	(52)	7.3	2.6	9.8	8.3	69	31	1.6	0.8	0.9	2.5	1.4	3.1	1.2	4.0	3.2
1937	(52)	7.9	5.4	13.4	11.3	86	14	4.6	2.0	1.3	0.9	0.5	2.9	1.1	4.2	3.1
1938	(56)	9.5	5.8	15.3	13.0	96	4	7.1	3.6	0.8	4.9	2.6	2.7	1.0	3.5	2.3
1939	(55)	9.4	6.1	15.5	13.2	94	6	5.8	2.7	0.4	5.8	3.2	2.5	1.0	2.5	1.9
1940	(63)	10.8	6.1	17.0	14.4	92	8	4.8	2.6	0.3	4.1	2.6	2.2	0.8	1.9	1.6
1941		8.8	8.8	17.6	14.9	93	7	4.8	3.4	0.3	5.6	3.0	2.0	0.8	1.8	1.5
1942		8.2	10.1	18.3	15.5	93	7	2.3	1.6	0.2	4.8	2.5		0.9	1.6	1.7
1943	(68)	5.8	13.3	19.0	16.1	93	7	0.1	0.1	0.3	4.9	3.2		1.1	1.5	1.6
1944	(64)	17.7	13.2	30.9	26.2	97	3	4.4	3.4	0.3				1.1	1.3	1.4
1945		30.5	13.8	44.2	37.5	96	4	6.5	5.3	0.2				1.0	1.1	1.1

APPENDIX 1 (Cont.)

1946	(75)	49.5	14.1	63.6	53.9	94	6	5.9	4.5	0.2				1.0	0.9	1.0
1947								6.1	4.7	0.2				0.9	0.9	
1948								8.0	4.2	0.8				0.9	1.1	
1949	55	24	31	55.6	31.9	55	45	7.3	3.4	1.0				0.9	1.3	2.3
1950	59	28	41	69.0	43.5	65	35	10.0	4.0	1.3				0.9	1.4	2.2
1951	62	21	53	73.6	50.2	65	35	9.7	3.0	2.0				0.9	1.4	2.3
1952	63	30	48	78.4	57.1	66	34	15.7	4.5	2.0				0.9	1.4	2.7
1953	65	44	40	83.6	64.1	69	31	6.6	2.8	0.7				1.2	1.7	3.2
1954	67	38	47	84.9	65.1	69	31	8.3	4.7	0.6				1.6	1.8	3.8
1955	69	28	58	86.3	67.6	68	32	10.4	6.0	0.5				2.3	1.8	3.9
1956	70	42	50	92.1	73.4	66	34	13.4	7.8	0.5				2.4	2.0	4.0
1957	72	30	74	103.2	84.3	68	32	15.3	8.9	0.4				2.6	2.1	3.9
1958	73	40	77	117.5	99.2	70	30	21.2	11.2	0.5				2.4	2.2	3.8
1959	75	46	81	126.9	106.0	70	30	19.4	11.2	0.5				2.5	2.0	3.7
1960	79	47	89	136.6	115.1	69	31	18.7	7.6	1.1					1.9	3.6
1961	77	48	103	150.9	130.2	72	28	10.0	6.9	0.2					1.9	3.6
1962	97	56	178	206.7	181.0	71	29	13.7	8.8	0.3					1.6	3.5
1963	101	57	237	255.7	229.7	74	26	11.3	6.9	0.4					1.6	3.4
1964	104	42	283	294.4	262.6	75	25	5.1	3.7	0.3					1.7	3.3
1965	110	61	319	340.7	305.0	75	25	1.2	1.0	0.2					1.8	3.1
1966	116	75	374	407.7	371.5	76	24	1.4	1.1	0.2					1.8	3.0
1967	121	57	466	488.0	448.0	76	24	0.7	0.6	0.2						

APPENDIX 1 (Cont.)

	Clients	Production			Consumption			Economic financial ratios					Real unit cost			
Year								Fensa			Ibérica					
		Own	Acquired	Distributed	Total	Industrial	Domestic	ROE	ROA	Debt	ROE	ROA	Arteta	Irati	Ibérica	Fensa
	No. from 1949 (thousands)	GWh			GWh	%		%		ppu	%		Cents/kWh @ 1913 value 3 year average			
1968	132	65	527	551.7	510.3	74	25	0.5	0.4	0.2						
1969	139	69	639	670.2	623.1	74	26	0.0	0.0	0.3						
1970	147	64	723	753.1	709.0	73	27	0.0	0.0	0.4						
1971	193	63	819	843.9	786.3	72	28	0.0	0.0	0.6						
1972	208	85	924	970.2	889.3	73	27	1.3	0.8	0.5						
1973	210	67	1,049	1,081.9	1,014.4	72	28	2.0	1.1	0.5						
1974	211	69	1,135	1,166.6	1,115.8	71	30	1.4	0.9	0.6						
1975	213	75	1,180	1,222.6	1,138.2	68	32	0.0	0.0	0.5						
1976	214	59	1,343	1,356.1	1,285.0	67	33	0.0	0.0	0.6						
1977	216	68	1,450	1,463.7	1,387.8	67	33	0.0	0.0	0.8						
1978	228	70	1,544	1,570.0	1,484.9	66	34	0.0	0.0	0.4						
1979	244	72	1,676	1,698.5	1,623.0	64	36	0.1	0.1	0.3						
1980	243	65	1,761	1,775.0	1,717.1	63	37	0.1	0.1	0.3						

ROA: return on assets; ROE: return on equity; ROS: return on sales.

Source: Own compilation from *consulting* monthly entries in the General Ledgers of Fensa (1927-1946), Annual Reports of Fensa (1930-1946); Annual Reports of Arteta (1930-1941), Annual Reports of Irati (1930-1959) and Annual Reports of Hidroeléctrica Ibérica/Iberduero (1930-1966).

Key: Real unit cost: total cost/kWh sold; ROA: income before tax/total assets; ROE: income before tax/shareholders' equity; ROS: income before tax/sales; Debt ratio: external financing/ self-financing (share capital + reserves). *Industrial clients in parenthesis.

APPENDIX 2
ECONOMIC AND FINANCIAL DATA (1930-1980)

	<i>Fensa</i>						<i>Ibérica</i>	<i>Hidroila</i>	<i>Irati</i>	<i>Arteta</i>
Year	Equity capital	Bonds	Profits	Sales	Distribution of dividends					
					Board of directors	Shareholders				
	10 ³ thousand pesetas				% profits	Dividend yield	Dividends	Dividends	Dividends	Dividends
1930	3,998	1,939	0,143	0,211			9	10	10	9.5
1931	4,977	1,979	0,217	0,347	10	5	9	10	11	10
1932	6,011	1,979	0,296	0,519	9	5	9	9	10	10
1933	6,025	1,979	0,317	0,744	10	4	8.5	9	8.8	10
1934	6,040	4,134	0,379	1,066	10	5	8.5	9	9.0	10
1935	6,059	4,251	0,392	1,082	9	5	8	9	9.5	10
1936	6,078	4,206	0,099	0,785				4.5	4.8	10
1937	6,078	5,158	0,280	1,020	9	3		5.5	4.8	10
1938	6,091	4,086	0,435	1,145	10	5	8	5	6.0	10
1939	7,832	4,052	0,454	1,207	13	5	6	5	8.9	12
1940	14,097	3,864	0,678	1,258	12	7	7	8	11.4	5
1941	20,012	3,591	0,958	1,540	13	5	7	8	11.8	10
1942	25,207	3,475	0,580	1,587	12	2	6	8	7.0	10
1943	25,244	3,272	0,024	1,480			6	8	8.7	5
1944	30,244	3,203	1,344	2,352	10	4	6	8	8.7	10

APPENDIX 2 (Cont.)

	<i>Fensa</i>						<i>Ibérica</i>	<i>Hidroila</i>	<i>Irati</i>	<i>Arteta</i>
Year	Equity capital	Bonds	Profits	Sales	Distribution of dividends					
					Board of directors	Shareholders				
	10 ³ thousand pesetas				% profits	Dividend yield	Dividends	Dividends	Dividends	Dividends
1945	30,298	2,863	1,973	3,078	10	4	5	7	8.7	10
1946	30,448	1,900	1,810	4,309	5	4	6	8	8.0	10
1947	30,598	1,732	1,861	4,539	5	4	6.5	9	8.3	10
1948	30,598	18,568	2,459	10,704	4	4	7	10	8.9	10
1949	30,598	18,892	2,244	12,383	5	4	7	10	8.8	10
1950	30,598	23,390	3,055	17,622	5	4	8.5	10	8.5	10
1951	30,598	19,504	2,964	19,663	5	4	9.5	10	8.4	10
1952	30,598	19,217	4,811	22,518	4	4	10	10	9.4	9
1953	45,888	18,645	3,048	33,008		7	11	10	9.4	10
1954	58,823	18,337	4,897	36,931		7	11	10	8.4	10
1955	60,541	17,677	6,301	43,688		7	11	12	8.4	10
1956	62,767	16,974	8,423	48,656		8	12	12	9.5	
1957	66,602	16,245	10,163	62,412		8	12	12	9.5	
1958	72,139	15,500	15,259	79,345		8	12	12	8.7	
1959	85,740	14,908	16,629	83,874		8	12	12	9.6	
1960	97,569	13,849	18,265	90,476		8	12	12	9.2	
1961	193,699	13,359	19,291	98,628		8	12	12		
1962	208,148	12,853	28,461	139,885		8	12	12		

APPENDIX 2 (Cont.)

1963	225,409	12,321	25,510	172,843		6	12	12		
1964	272,990	11,767	14,046	195,332		4	12	12		
1965	642,327	11,184	7,629	220,156		4	12	12		
1966	643,532	10,567	8,758	262,999		4	12	12		
1967	824,845	9,913	5,656	314,927						
1968	807,576	9,238	4,025	364,215						
1969	811,601	8,564	0	435,635						
1970	811,313	7,820	0	498,752						
1971	811,229	7,034	0	610,252						
1972	971,229	166,221	13,041	687,693						
1973	984,200	165,368	19,194	1,208,865						
1974	1,186,933	164,463	17,060	1,865,354						
1975	2,003,127	155,816	0	2,352,654						
1976	2,004,503	146,883	0	3,079,450						
1977	2,004,503	137,118	0	3,736,621						
1978	3,022,523	126,298	0	4,349,019						
1979	5,355,706	116,429	7,519	5,182,181						
1980	6,998,798	105,165	7,661	7,297,497						

Source: see Appendix 1 and Antolín (2006), Aubanell (2006), Gómez Mendoza (2006) and Sudrià (2006) in relation to the dividends of *Ibérica* and *Hidroila*.

Key: Dividend yield: annual dividends per share/price per share; Equity capital: share capital and reserves.